

XVI.—*Natural-History Notes from H. M. Indian Marine Survey Steamer 'Investigator,' Commander ALFRED CARPENTER, R. N., D. S. O., commanding.—No. 10. List of the Pleuronectidæ obtained in the Bay of Bengal in 1888 and 1889, with descriptions of new and rare species.—By ALFRED ALCOCK, M. B. (A.B.E.R.), Surgeon-Naturalist to the Marine Survey.*

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§ 1. *Introduction.*

This paper gives merely a list of the *Pleuronectidæ* obtained by the trawl and dredge in the Bay of Bengal during two seasons' work of H. M. I. M. Survey Steamer 'Investigator,' with descriptions of new and rare species. Complete synonymies are not given, mainly because the systematic exploration of the Bay can only be regarded as begun, and it would be premature to catalogue any one group until the whole basin has been more thoroughly explored.

This initial list contains the names of 29 species, of which 11 appear to be new to science, 3 are rare species not before met with in Indian waters, while the remaining 15 are well-known forms.

Again, of these 29 species, 23 are from the Orissa coast and the Ganjam coast north of Gopalpur, 3 are from the deeper open waters of the northern end of the Bay, while 2 are from the east coast of Ceylon, and 1 from Cocanada. These last 6 species are the fruit of occasional dredgings, so that we are left with 23 species representing four months regular trawling off the Orissa coast, or rather off the eastern coast of the peninsula between False Point on the north and Gopalpur on the south—a region nearly corresponding with the debouchement of the Máhánaddi Delta.

The physical features here are those of all Indian deltas where the land is making precarious advances on a shoaling muddy sea. Low-lying wastes of drifting sand alternate with still lower-lying estuarine swamps; the coast line presents the unbroken level of a recently formed

alluvium; the bed of the sea is an almost imperceptible slope of fine sand and mud, and the more or less turbid waters are consequently so shallow that the twenty-fathom line is distant from five to thirteen miles from shore, while the hundred-fathom line ranges from fifteen to twenty-two miles, as was determined by the 'Investigator' in her recent survey. Towards the south the sea deepens, and the bottom becomes more sandy.

The waters of this region swarm with crustaceans and fishes. *Penæidæ*, *Paguridæ*, and all the families of the Brachyura exist in the greatest abundance, while the surface waters are crowded with the lower crustacea and with crustaccan larvæ. The commonest fishes are *Sciæna*, *Kurtus*, *Polymemus*, *Equula*, *Arius*, *Pellona*; *Carcharias Scyllium*, *Trygon*; and, among the Pleuronectids, *Pseudorhombus* and *Cynoglossus*.

§ 2. *List, with Descriptions, of the Shallow-Water Fishes obtained (in the above region) during season 1888-89.*

1. PSETTODES ERUMEI, (Bloch).

Günther, Catalogue, iv, 402; Day, Fishes of India, p. 422, pl. xci, fig. 4.

Met with from False Point to Ganjam, from 10 to 23 fathoms.

2. ARNOGLOSSUS MACROLOPHUS, n. sp., Pl. XVIII, Fig. 2.

D. 88-90. A. 67. L. Lat. 55.

Body rather elongate, its height being one-third of the total length. The length of the head is contained nearly $4\frac{1}{2}$ times in the total, and is equal to its height. The lower jaw projects slightly. The snout is obtuse, almost as long as the eye, and excavated in front of the upper eye.

Eyes on the left side, large, their diameter being contained nearly $3\frac{3}{4}$ times in the length of the head. A large patent nostril in the excavation of the snout above the upper eye; and two in front of the interorbital space, the anterior being valved. Cleft of mouth very oblique. The length of the maxilla is contained $2\frac{7}{8}$ times in the length of the head. A single row of small sharp close set uniform teeth in each jaw. The head of the vomer is very prominent. The tongue is styliform. Gill-cleft very wide: the margin of the operculum forms a semicircle. Gill-rakers distant, short, slender, and without any serrations. Integument covered with small scales, strongly and sharply ctenoid on the coloured, cycloid, thin, and excessively deciduous on the blind side. The scales invest the base of the caudal and the lower third of the rays of the vertical fins, at least on the coloured side.

Lateral line with a semi-circular curve above the pectoral. *Fins.* The dorsal fin begins in front of the anterior nostril and extends exactly up to the base of the caudal: its first six rays are prolonged, the longest being more than half the total length of the body. The anal is separated from the ventral by a median double-toothed spine, and extends exactly up to the base of the caudal: its rays are similar to the posterior rays of the dorsal. The caudal consists of 17 branched rays, of which the longest are one-sixth the total length of the body: it is obtusely pointed. The pectoral is much more developed on the coloured side, where it is as long as the head exclusive of the snout, and consists of 9 rays: the right pectoral is one-third less than the left in length, and consists of 6 rays. The ventrals are both well developed, and both coloured: the left has 6 rays arranged in a line from the throat to the anal, the right is of the usual form.

Colours in life, dull smoky brown with a circumferential row of ill-defined dark blotches just inside the vertical fins, and others along the lateral line. Both ventrals nearly black. Coloured pectoral with a transverse black band in its posterior half.

Total length $3\frac{5}{8}$ inches.

Locality of capture, 5 miles south of Ganjam in 25 fathoms, on a clean sandy bottom. Only one specimen.

3. BRACHYPLEURA XANTHOSTICTA, n. sp., Pl. XVII, Fig. 3.

B. 6. D. 68-69. A. 44-46. L. lat. 30.

Body rather elongate, its height being one-third of the total length. The length of the head is one-fourth of the total and equal to its height. The lower jaw projects and forms the tip of the snout, and there is a sharp knob at the symphysis. The snout is pointed and is as long as the eye. Eyes on the right side, large, being one-fourth of the head-length in diameter; they are separated by a sharp ridge; the upper is in advance and is very oblique. Nostrils in front of the interorbital space, the anterior being valved: on the left side they are very inconspicuous and are placed almost on the dorsal profile. Mouth wide and forming an almost vertical arch: the maxilla extends behind the level of the lower mid-orbit and is slightly over half the length of the head. Numerous close-set, pointed, conical, curved teeth in both jaws and on the strongly projecting head of the vomer: those in the premaxilla are arranged in a double series anteriorly, and those in the lower jaw are in a double series throughout, the inner row being incurved, while at the symphysis they are in a thick patch. Gill-cleft very wide. Margin of the opercle trilobed. Gill-rakers few, distant, lanceolate and coarsely serrated on their upper surface. Integument covered with large, thin

deciduous scales, which are finely ctenoid on the coloured, cycloid on the blind side. *Lateral line with a wide curve above the pectoral.* *Fins.* The dorsal begins almost on the upper lip of the blind-side, below the nostrils on that side: the 4th to the 10th rays are elongated *in the male only*, the 5th to the 7th being nearly half the total length of the body. The anal arises some distance behind the ventrals, its rays are rather less than one-third the body height in length. All the rays of the vertical fins are simple. The caudal has 16 rays, its shape is rhomboidal, and its length one-fifth of the total. The pectorals are set on very obliquely on the coloured and almost horizontally on the blind side: they have 11 rays, and the right (coloured) is rather longer than the left and equal to the caudal. The ventrals have 6 rays; the left arises behind the right. *Colours during life*—body and fins on right side a light sandy brown with numerous longitudinal rows of large bright-orange spots. *Internal anatomy*: there is a simple saccular stomach; the intestine is short and has three long diverticula arising at different levels behind the pylorus.

The length ranges from $3\frac{3}{4}$ in. to $4\frac{3}{8}$ in.

Captured 28 miles S. W. of Puri, and 5 miles S. of Ganjam, on both occasions in 25 fathoms and on a clean sandy bottom.

This fish goes beyond the confines of the genus *Brachypleura* (Günther, Cat. iv. 419) in the double row of teeth in the lower jaw, and in the curved lateral line; but one hesitates to construct a new genus on these characters, when there are so many other important points of agreement.

4. PSEUDORHOMBUS RUSSELLII, (J. E. Gray).

Günther, Cat. iv. 424; *Pseudorhombus arsius*, Day, Fishes of India, p. 423, but not *Pleuronectes arsius* of Hamilton-Buchanan's description, Fishes of Ganges, pp. 128 and 373.

Met with commonly near river-mouths and in estuaries.

5. PSEUDORHOMBUS JAVANICUS, Bleeker.

Günther, Cat. iv. 427; Day, Fishes of India, p. 424.

Met with every where from 7 to 23 fathoms. The specimens taken from hard sand are more brightly coloured than those from muddy bottoms.

6. PSEUDORHOMBUS MALAYANUS, Bleeker.

Bleeker, Atlas Ichthyologique, tom. vi, pp. 7-8. pl. ccxxxiv, fig 2.

Bleeker distinguishes this species from *P. russellii* by its scales, which are ctenoid on both sides, and by the concavity of the lower

border of the preopercle. But for these characters it is impossible to distinguish the one species from the other, even by colour. Found in the more shallow and turbid waters.

7. *PSEUDORHOMBUS TRIOCELLATUS*, (Bloch).

Günther, Cat. iv, 428; Day, Fishes, 424; Bleeker, Atl. Ichth. tom. vi, p. 29, pl. cxxxix, fig. 1.

This is a very common species. It was taken everywhere usually in 7 to 8 fathoms and on sandy bottoms, where its coloration is much more brilliant than in turbid waters.

8. *RHOMBOIDICHTHYS AZUREUS*, n. sp., Pl. XVI, Fig. 3.

D. 84. A. 64. L. 1. circ. 55.

This species approaches very closely to the description of *R. leopardinus* (Günther, Cat. iv, 434), but its scales are much less numerous—55 rows instead of 80,—and they are remarkably deciduous.

Body oval, its height being a little over half its length, without the caudal. The head is short and deep, with the anterior profile concave between the eyes, its length $3\frac{3}{4}$ in the total without the caudal, and considerably less than its height. The snout projects conspicuously, its length is hardly half the diameter of the eye, and in the male it bears a short horizontal horn. The length of the eye is two-sevenths of the length of the head; the inner orbital margins are very sharp and in the male knobbed. The lower eye is nearly half a length in advance. The interorbital space is deeply concave, scaly only in its posterior half, and in the male is nearly one diameter, in the female half a diameter of the eye in width.

The nostrils on the blind side are very minute.

The cleft of the mouth is narrow and almost vertical; the length of the maxilla is contained $3\frac{3}{4}$ times in the head-length. Teeth in a single series in the upper and a double series in the lower jaw; they are close-set, sharp and uniform like the teeth of a comb. Gill-rakers few and distant, on the first arch there are only six. Integument covered with delicate deciduous scales, which are ctenoid on the coloured, cycloid on the blind side. Lateral line with very prominent tubes, and with a strong curve above the pectoral. Fins. Dorsal with its longest rays in the anterior part of its last half, where they equal nearly half the head-length. A projection of the humeral arch forms a sharp spine in front of the anal fin.

Length of caudal $5\frac{3}{4}$ in the total; there are 17 rays. The pectoral on the coloured side is the more developed, having 10 rays, while the right has only 9. The left ventral is much longer and broader than the

right, and occupies the whole median line from the throat to the anal fin: each has six rays. *Colours during life*—dull smoky brown with a series of darker blotches round the coloured side inside the vertical fins. Vertical fins with dark speckles. The male with ten or eleven small brilliant azure spots arranged in two rows on the snout and in front of the interorbital space. Length: male $3\frac{1}{4}$ inches, females $3\frac{3}{8}$ to $4\frac{5}{8}$ inches.

Met with in 7 to 13 fathoms, from 8 to 20 miles S. W. of Puri on muddy bottoms, and once on clean sand.

The fish next to be described might, at first sight, be taken for the immature form of some larger *Pleuronectid*. But after due consideration, and after finding a second very similar yet quite distinct form, I venture to describe both as new, and to provisionally unite their common characters into the diagnosis of a new genus, for which the name *Scianectes*, in allusion to the delicate transparency of the tissues, is suggested.

SCIANECTES, gen. nov.

Jaws and dentition equal on both sides. Dorsal fin commencing before the eye, on the snout. Body pyriform and delicate. Mouth small, the length of the maxillary being less than one-third of the length of the head. Teeth minute in a single series in both jaws. Vomerine teeth. Eyes on the left side and close together. All the rays of the vertical fins simple, elongated, weak, and filamentous. Scales minute, membranous, and deciduous. Lateral line with a curve above the pectoral. Gill-membranes united at the throat. Gill-rakers distant and short.

9. SCIANECTES LOPHOPTERA, n. sp., Pl. XVI, Fig. 2.

B. 5? D. 86-88. A. 66.

Body pyriform, transparent and delicate, its height being contained $2\frac{2}{5}$ in the total, without the caudal. Head short, its length being $3\frac{1}{2}$ in the total without the caudal, and three-fourths of its height. Snout obtuse, barely equal to the eye in length. Eyes on the left side situated in the extreme anterior part of the head, separated from each other by a longitudinally grooved ridge; the lower slightly in advance; their diameter one-fifth of the head-length. The cleft of the mouth forms an almost vertical arch. The length of the maxilla is one-fourth the length of the head. Minute teeth in a row in both jaws, and on the vomer. Gill-cleft very wide. Opercle almost membranous. Gill-rakers in the form of distant delicate spines.

Integument covered with minute, delicate, excessively deciduous scales. Lateral line salient, with a semicircular curve above the pectoral,

and continued on to the end of the caudal. Vertical fins of striking height, extremely weak and slender. The longest dorsal rays, which are near the middle of the fin are equal to the head-length in height, and the longest anal rays are slightly longer. The interneural and interhæmal spines are very elongate. The pectoral is much more developed on the coloured side, where if laid forward it reaches to the vertical from the hinder edge of the upper (posterior) orbit.

The ventrals are distinct from the anal: the left is more expanded than the right.

The caudal is long and pointed, being contained five times in the total: it has 17 rays.

Colours in life. Transparent white with minute black dots. Three narrow black lines along the body, one of which is the lateral line, while the others follow the lines of origin of the interneural and interhæmal spines respectively. Vertical fins black with irregular milk-white blotches. Left ventral black. Left pectoral grey tipped with black. On the right side, owing to the transparency of the body, the three black lines of the coloured side shew through. Length, $3\frac{1}{2}$ inches.

Two specimens were taken in 68 fathoms 16 miles E. of the mouth of the Devi river in the Máhánaddi delta, from a soft bottom of very fine sand. The second species of *Scianeetes* will be described among the fishes from a deeper and more open part of the Bay.

10. SOLEA OVATA, Richardson.

Günther, Cat. iv, 472; Day, Fishes, p. 426, pl. xciii, fig. 1.

Met with everywhere, more often on a soft bottom of fine sand and mud, but also on hard sand.

11. SOLEA OCVLUS, n. sp., Pl. XVIII, Fig. 3.

D. 98. A. 65. L. 1. 100-102.

This species resembles *Solea hartzfeldii* (Günther, Cat. iv. 471, and Bleeker, Atlas. Ichth. tom. vi, p. 25, pl. cexlvi, fig. 1), from which it differs in the form and arrangement of the dorsal and ventral fins, in the proportions of the head to the body, and in coloration.

Body ovate, its height one-third of the total length. Head with a symmetrically rounded profile, its height being a little greater than its length, which is nearly $4\frac{1}{2}$ in the total. The snout forms a rostral hook, which curves round behind the symphysis of the lower jaw, touching the vertical from the front edge of the anterior eye. Eyes situated in the middle of the head, the upper half-way in advance of the lower: their diameter is $6\frac{1}{2}$ in the head-length, and they are about half a diameter apart.

On the coloured side two nostrils in front of the lower eye and nearly on the upper lip, the anterior forming a tube nearly equal to the eye in length, the posterior being a small foramen. On the blind side two nostrils, of which the anterior is perforated in a large fleshy sucker-like papilla.

The cleft of the mouth forms a semicircle with the convexity forwards and upwards, its angle reaches the vertical from the middle of the lower eye. Small villiform teeth in the jaws on the blind side. Gill-cleft narrow. No fringo beneath the lower jaw. Integument invested with small scales ctenoid on both sides. The lateral line is straight on the coloured side, but on the blind side it has a Y-shaped break just behind the gill-cleft.

Fins. The dorsal extends from the tip of the rostral hook to the base of the caudal, and the anal is continuous with the right ventral, the united fins extending from the point where the rostral hook opposes the lower jaw to the base of the caudal. The basal fourth of the vertical fins, both rays and interradial membrane, is regularly and evenly invested, on the coloured side only, with rows of small scales.

The caudal has 18 rays; its length is one-eighth of the total. Ventrals with 5 rays: the coloured ventral continuous with the anal, and left ventral connected with its fellow and with the anal by a flap of skin.

Pectorals absent.

Colours during life. Ground colour light brown, intersected by a most elegant network of irregular light olive-green lines forming a somewhat pentagonal pattern. Along the dorsal curve are five large, perfect, and complicated ocelli with light-green centre, brown irides, and light green margins. Four similar ocelli along the ventral curve, and another smaller one at the base of the caudal. A few small incomplete ocelli along the lateral line, and numerous dark brown dots and rings scattered all over the body. Fins transparent grey-green, every fourth or fifth ray uniform dark brown, and the intermediate rays streaked with brown.

Length 4 inches. Two specimens.

Taken in 7 fathoms, from a hard sandy bottom, about 32 miles S. W. of Puri.

12. SYNAPTURA QUAGGA, (Kaup).

Günther, Cat. iv, 485. [*Synaptura zebra* of Day, Fishes of India, p. 430, but not Cantor, nor Bloch's descrip.]

Found all along the coast in 7-10 fathoms.

13. SYNAPTURA CORNUTA, (Kaup).

Day, Fishes of India, p. 430, pl. xciv, fig. 4. *Aesopia cornuta*, Kaup, Günther, Cat. iv, 487.

Only one specimen was obtained, a female, in 7-8 fathoms.

14. CYNOGLOSSUS CARPENTERI, n. sp., Pl. XVIII, Fig. 1.

D. circ. 100. A. circ. 80. V. 4. C. 10. L. lat. circ. 95.

This species is one of those which has on the left side two nostrils, one of them interorbital, and three lateral lines.

Body tapering acuminate backwards from the gill-opening, the ventral profile bulging strongly just behind the head, and the tail long and slender. The height of the body is nearly $3\frac{1}{2}$ in the total length, and equal to the length of the head. The snout is an obtuse-angled triangle, and is one-third the length of the head. The rostral hook ends behind the symphysis of the lower jaw. The eyes are prominent, in length one-tenth of the head, separated by a concave space narrower than the eye: the upper is nearly half a length in advance. Two nostrils on the coloured side, one in front of the inter-orbit, the other in front of the lower eye, and tubular. Mouth large, its angle is a whole eye-length behind the posterior border of the lower (hinder) orbit and equidistant between the tip of the snout and the gill-opening. Lips not fringed. Tongue very large, completely filling the mouth. The gill-cleft is high. The opercle is conspicuously expanded below and behind, and the branchiostegal rays and membrane extend a considerable distance behind its edge, giving the appearance of a broad fringe. The integument is invested with small strong scales, which on the blind side and anterior half of the coloured side are cycloid, and on the posterior half of the coloured side sharply ctenoid. Three lateral lines on the left side, the middle separated from the upper by 17, and from the lower by 22 rows of scales at the respective points of greatest divergence: none on the right. Fins: one ventral united with the anal. The vertical fin-rays are delicate; the longest are nearly equal to the snout in length.

Colours in life. Left side uniform bright chestnut-brown; the fins a brighter red-brown; the caudal in the female specimen black. The whole of the opercle is blue-black, owing apparently to the pigmentation of the gill-membrane, the extension backwards of which beyond the opercle is black. Intestine nearly one-third longer than the body and convoluted, without diverticula. The ovary of the female was enlarged and crowded with eggs $\frac{1}{4}$ of an inch in diameter.

Length of male $6\frac{1}{2}$ inches, of the female $6\frac{3}{8}$ inches.

Two specimens were taken in 68 fathoms, 68 m. E. of the mouth of the Devi river in the Máháuaddi delta, on a soft bottom of very fine sand.

I have named this species after the distinguished officer in charge of the Marine Survey of India, Commander Alfred Carpenter, R. N., D. S. O., the pioneer of scientific hydrography in India.

15. *CYNOGLOSSUS MACROLEPIDOTUS*, Bleeker.

Günther, Cat. iv, 496; Day, Fishes of India, p. 434, pl. xvi, fig. 3.

Met with usually on soft and muddy bottoms, in 7 to 10 fathoms, off the central part of the delta, where it is exceedingly common, and grows to a length of one foot.

16. *CYNOGLOSSUS OLIGOLEPIS*, Bleeker.

Günther, Cat. iv, 496; Day, Fishes of India, p. 433, pl. xcv, fig. 4.

This species was always found with *C. macrolepidotus*, chiefly on soft bottoms, in 7 to 10 fathoms, where it reaches a length of nearly fifteen inches.

17. *CYNOGLOSSUS QUADRILINEATUS*, Bleeker.

Günther, Cat. iv, 497; Day, Fishes of India, p. 435.

Met with by the 'Investigator' only on bottoms of hard sand, in 6 to 10 fathoms, in the southerly part of the region, 15 to 30 miles S. W. of Puri.

18. *CYNOGLOSSUS LIDA*, Bleeker.

Günther, Cat. iv, 498; Day, Fishes of India, p. 436, pl. xcvii, fig. 3.

A number of specimens were taken on one occasion, with a large number of *C. quadrilineatus*.

19. *CYNOGLOSSUS INTERMEDIUS*, n. sp. ?

D. 106. A. 85. L. 1. 100-103. V. 4. C. 10.

This is a form which has characters similar to those of both *C. lida* and *C. bengalensis*. Only one specimen was taken at the same time with *C. quadrilineatus*, to which also it has a strong superficial resemblance, and with *C. lida*. In appearance it is hardly to be distinguished from the latter, but the ventral fin is united with the anal, the scales are more numerous and less ctenoid, and the head is proportionately longer. In appearance it would not be confounded with the specimens of *C. bengalensis* in the Indian Museum, though the description is not remarkably different. In describing it from a single specimen it is not yet intended to establish a new species.

Symmetrical semicircular snout, abruptly pointed tail.

On the left side two lateral lines separated by 14 rows of scales ;

and two nostrils, one in front of the interocular space, the other in front of the lower angle of the lower eye. One lateral line on the blind side. Length of head $4\frac{1}{2}$ in the total and a little more than its height. Length of eye $10\frac{1}{2}$ in the head; the upper eye slightly in advance. Interocular space two-thirds the length of the eye in width. The rostral hook ends beneath the eye. The angle of the mouth is in the vertical from the posterior border of the lower orbit and nearer to the gill-opening than to the tip of the snout. Lips not fringed. The length of the snout is $2\frac{1}{3}$ in the head-length. The height of the body is a little over one-fourth of the total length. One ventral fin united with the anal. The height of the vertical fins is one-fifth the height of the body. Scales etenoid on both sides. Sepia-coloured, each scale with a light centre and with a dark spot near the middle of its posterior margin.

Total length $8\frac{1}{4}$ inches.

In 7 fathoms on a bottom of hard sand 32 miles S. W. of Puri. The specimen is a female.

20. *CYNOGLOSSUS PUNCTICEPS*, (Richardson).

Günther, Cat. iv, 500; Day, Fishes of India, p. 437, pl. xcvi, fig. 1.

A single male specimen was taken in 8 fathoms on a soft bottom, off Puri.

21. *CYNOGLOSSUS BREVIS*, Günther.

Günther, Cat. iv, 500; Day, Fishes of India, p. 437, pl. xcvi, fig. 2.

A single female specimen was taken, on a clean sandy bottom, in 7 to 8 fathoms, off the Chilka Lake bar.

22. *CYNOGLOSSUS SEMIFASCIATUS*, Day.

Day, Fishes of India, p. 436, pl. xcvi, Fig. 5.

A single specimen was got in 6 to 10 fathoms on a soft bottom, north-east of Puri.

23. *CYNOGLOSSUS MELANOPTERUS*, Bleeker.

Günther, Cat. iv. 502. [*Cynoglossus monopus*, Bleeker Atlas Ichth. tom. vi, p. 38, pl. ccxlv, fig. 4.]

Six specimens of a fish which appears to be this species were taken in 7 fathoms, between 30 and 35 miles S. W. of Puri. They were caught in the small hand-dredge, which came up full of grass-like seaweed. The movements of this fish, when placed in a large tub of water, were singularly rapid, and it is surprising that it should have been caught in the very narrow mouth of a slow-moving dredge. The larger specimens differ from Bleeker's description in the following particulars: (1) the number of transverse rows of scales is over 120; (2) the lateral

lines are separated by 18 to 19 scales at the level of greatest divergence; and (3) the upper lateral line is sinuous.

During life, the eyes of this *Cynoglossus* almost resemble the stalked eyes of a gastropod mollusk.

There is a simple saecular stomach, and a simple intestine much convoluted, and exceeding in length the total length of the fish.

This completes the list of the Orissa Coast collection.

Here also may be mentioned the following, as its habitat is very similar to that of the Orissa fishes:—

26. *PLAGUSIA BILINEATA*, (Bloch).

Günther, Cat. iv, 492: Day, Fishes of India, p. 431.

Taken on a muddy bottom in 4 to 5 fathoms, near the Sacramento shoal, off the Godávari Delta.

§ 3. *List, with Descriptions, of the Shallow Water Forms obtained during Seasons previous to 1888-89.*

24. *ARNOGLOSSUS POLYLEPIS*, n. sp., Pl. XVI, Fig. 1.

D circ. 82. A. circ. 60. L. 1. 90 to 100.

Body oval, its height being a little over half the total length, without the caudal. Length of head a little over one-third the same length; its height greater than its length; its dorsal profile slightly concave in front of the upper eye. Length of the snout not much more than half the length of the eye, which is one-third the length of the head. The lower eye in advance. The interorbital space is a grooved ridge. Nostrils on the coloured side both sub-tubular. Mouth large, the maxilla being two-fifths the length of the head. Teeth small, sharp and uniform, in a single series in both jaws; in the upper jaw close-set like the teeth of a comb; in the lower jaw extending further backwards on the right side.

Gill-rakers rather close; lanceolate.

Integument clothed with very small deciduous scales, which are ctenoid on the coloured, cycloid on the blind side. Lateral line on the coloured side with a strong curve above the pectoral, on the blind side gradually rising without a marked anterior curve. First two rays of the dorsal fin broad and thickened in their basal half, tapering above. The longest dorsal rays, just behind the middle of the fin, are a little more than one-fourth the body height: behind them the rays rapidly shorten, giving the fin an angular outline. The longest anal rays, about the middle of the fin, are two-sevenths of the body height, and the rays behind them diminish in the same way as the posterior dorsal rays. There

is a sharp median pre-anal spine. Left pectoral the more developed, consisting of 8 rays while the right has but six. The left ventral originates in front of the right and is more expanded: both have 6 rays. The caudal has 17 rays, and is $5\frac{1}{3}$ in the total length. Colours in spirit. Olive brown, with numerous small but complete dark rings, a series of which form a ring round the body just inside the vertical fins. Two conspicuous dark ocelli along the straight part of the lateral line, and another on the posterior limb of the curved part. Fins speckled with black.

Total length $3\frac{3}{5}$ inches. Taken in 34 fathoms off the E. coast of Ceylon.

25. SAMARIS CRISTATUS, Gray, Pl. XVII, Fig. 4.

Günther, Cat. iv, 420.

D. 80. A. 52. L. lat. 75.

Height of body nearly $2\frac{3}{4}$ in the total, without caudal. Length of head nearly $4\frac{1}{4}$ in the total without the caudal; its height being much greater. Length of snout about half the length of the eye; lower jaw slightly prominent. Eyes large, their length $2\frac{3}{4}$ in the head length; the lower barely in advance; separated from each other by a prominent sharp ridge. Pupil with a semilunar flap from the iris above and below. On the coloured side a long tubular nostril overhangs the upper lip, in front of a simple perforated nostril. Mouth small; its cleft oblique: maxilla one-third the length of the head. Teeth villiform; in several bands in both jaws. Gill-cleft wide. Scales very small, ctenoid on the coloured, cycloid on the blind side. The dorsal fin commences on the snout, its first ray being connected with a flap of coloured skin which passes obliquely across the snout, behind the mouth, on the blind side. The first thirteen rays are elongated, so that, when laid back, they reach in two specimens to the 67th ray, and in one beyond the base of the caudal. These rays are broad and stout. The remaining dorsal rays are slender, those in the posterior fourth being longer than the rest, and equal to half the height of the body. The longest anal rays are equal to, and opposite these. The right pectoral, which consists of four stout rays, is elongate, and equal to the greatest height of the head: it is set on very obliquely. There is no pectoral fin on the left side. Ventrals with 5 rays, those of the right fin elongate, and spatulate at their free ends; the first ray being of nearly equal length with the pectoral. Left ventral well developed, but not prolonged. Caudal with 16 rays, inclined slightly downwards; its length is about one-fifth of the total. Sepia-coloured, in spirit, beautifully mottled with purplo-brown and black, in a sinuous ring round the whole side: outside this the

ground colour is lighter. The colours and their arrangement recall the appearance of certain stone-encrusting lichens. Snout white: anterior prolonged dorsal rays black at the base, and pure milk-white throughout their free extent: the rest of the dorsal fin, and the anal, dark sepia with black blotches and a row of small white dots: pectoral black: right ventral striped black and white: left ventral grey tipped with black. The total length of the specimens ranges from 2 to $2\frac{3}{4}$ inches.

Taken in 34 fathoms, off the E. coast of Ceylon.

§ 4. *Descriptions of the Deep-Sea Forms obtained from the Commencement of the Survey to date.*

Three new deep-sea fishes have next to be described, namely, a second species of the new genus *Scianectes*, and two species of the genus *Aphoristia*.

27. *SCIANECTES MACROPHthalmus*, n. sp., Pl. XVI, fig. 4.

B. G. D. 88. A. 68.

Body pyriform, transparent and very delicate; its height not quite $2\frac{2}{3}$ in the total, without caudal. The length of the head is one-third of the total, without caudal, and the height rather more. The snout is obtuse and half as long as the eye. Eyes on the left side, their diameter $3\frac{1}{2}$ in the length of the head; the lower slightly in advance, and separated from the upper by a downward shelving ridge. Cleft of mouth nearly vertical: the maxilla being $3\frac{1}{2}$ to $3\frac{2}{3}$ in the length of the head. Minute teeth in a row in each jaw, and in a patch on the vomer. Gill-cleft wide; opercles thin; branchiostegal rays prolonged. Gill-rakers distant, lanceolate. Body covered with minute, thin, and very deciduous scales. Lateral line salient: it has a rather shallow curve above the origin of the pectoral, and is continued along the caudal. The dorsal fin commences on the snout; its longest rays are a little more than half the length of the head, and slightly shorter than the longest anal rays. Interneural and interhaemal spines long. A small median pre-anal spine. The pectoral is more developed on the coloured side, where if laid forward it reaches to the middle of the lower (anterior) eye. Ventrals six-rayed; the left more expanded than the right. Caudal long and pointed, with 17 simple rays; its length one-fifth of the total. Colours—left side white, with a few minute black dots. The body is traversed by three narrow black longitudinal lines, one of which is the lateral line, while the others follow respectively the outlines of the tips of the neural and haemal spines; vertical fins black; left pectoral grey at its base and black in its posterior two-thirds; left ventral black; prolongation of the left branchiostegals and meubrauc black. Total length $3\frac{1}{2}$ inches. One specimen.

Taken 40 miles S. W. of Akyab, in 100 fathoms.

The two species of *Aphoristia* have certain points in common: both sides of the body are coloured, there are two nostrils on the eye side, the cleft of the mouth is almost horizontal, and the anterior dorsal rays are rather widely separated and inter-connected by membrane only at their bases.

28. *APHORISTIA GILESII*, n. sp., Pl. XVII, Fig. 2.

D. 97-98. A. 83-85. C. 14. V. 4.

Body lanceolate; its greatest height, which is anterior to the vertical middle, is just over one-fourth of the total. The head is much expanded downwards in the opercular region; its length is contained $4\frac{1}{2}$ times in the total, and is $5\frac{3}{4}$ times the length of the snout, the outline of which anteriorly is abruptly truncated.

The snout and jaws are covered with small scales.

The eyes are well within the anterior third of the head, and almost exactly on the same level: their length is nearly one-eighth that of the head. The interocular space is scaly, the scales encroaching on the margins of the eyes. A simple perforated nostril in the anterior part of the interorbit, and a tubular one about half as long as the eye midway between the lower eye and the tip of the snout. No nostrils on the blind side. Cleft of mouth horizontal, with a slight down-curve at its angle, which is in the vertical from the middle of the eye.

Dentition feeble; on the blind side only. Gill-cleft narrow and low: branchiostegal rays and membrane prolonged downwards and backwards considerably beyond the edge of the operculum. Scales of moderate size, ctenoid on both sides, and so deciduous that their number could not be correctly counted. The dorsal fin begins over the middle of the upper eye: its first eight rays are separated by wide interspaces, and (apparently) connected by membrane only at their bases: the longest rays are near the middle of the fin and are contained $2\frac{2}{3}$ times in the body height. The distance of the origin of the anal from the snout is equal to the body-height: the longest anal rays are slightly longer than the longest dorsal.

The ventral arises between the gill-covers, and is separated from the origin of the anal by little more than an eye-length. Length of caudal $8\frac{2}{3}$ in the total.

Both sides are coloured, recorded in life as "Earth colour with parallel brown lines." In spirit, it is yellow with numerous fins parallel brown lines extending along the body from head to caudal: fins brown. Total length, $4\frac{1}{2}$ inches. One specimen.

Locality. Lat $20^{\circ} 17' N$. Long $88^{\circ} 51' E$. 193 fathoms. I have

named this species after Dr. G. M. Giles, who, in the 'Investigator,' has added so many deep-sea fishes to the Indian collection.

29. APHORISTIA WOOD-MASONI, n. sp., Pl. XVII, Fig. 1.

B. 5. D. 90. A. 78. C. 14. V. 4. L. lat. circ. 85. L. tr. circ. 34.

Body lanceolate; its greatest height, which is just behind the vertical middle, is $4\frac{1}{2}$ in the total. Head much expanded in the opercular region; its length $5\frac{1}{2}$ in the total, and $4\frac{2}{3}$ times the length of the snout, which terminates in an abrupt straight edge.

Snout and jaws covered with small scales. Eyes situated just within the anterior third of the head; the upper very slightly in advance; their length one-seventh that of the head.

The interocular space is scaly, with two rows of scales, which encroach on the margins of the eyes. There is a simple nostril between the eyes anteriorly, and a tubular nostril as long as the eye midway between the lower eye and the tip of the snout. Cleft of mouth horizontal, with a slight down-curve at its angle, which hardly passes behind the vertical from the front edge of the lower eye. Dentition feeble, and more developed on the blind side. Gill-cleft low: branchiostegal rays and membrane prolonged beyond the opercular edge. Scales ctenoid on both sides: rather deciduous. The dorsal fin begins above the middle of the upper eye: its first two rays are approximated, but the next seven are separated by wide interspaces and connected together only in their lower part: the longest dorsal rays, near the middle of the fin, are contained $3\frac{1}{2}$ times in the body height, and the longest anal rays are slightly longer. The distance of the origin of the anal from the snout is equal to the body-height. The ventral is separated from the anal by almost its own length. Length of the caudal one-ninth of the total. Colours in spirit, bluish-grey on both sides, with a broad blue-black band all round each side, occupying the whole extent and breadth of the regions of the inter-neural and interhaemal spines, and very numerous parallel black lines extending from snout to caudal through the middle of each row of scales: opercle black: fins black, except the caudal which is grey. Total length 5 inches. One specimen.

Dredged $7\frac{1}{2}$ miles E. of North Cinque Island (Andamans), in 490 fathoms, by Professor Wood-Mason on board the 'Investigator.'

EXPLANATION OF THE PLATES.

PLATE XVI.

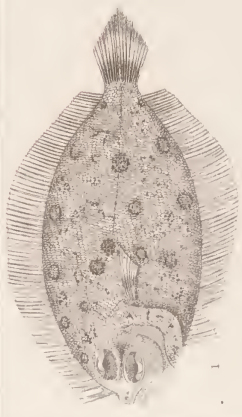
- Fig. 1. *Arnoglossus polylepis*, n. sp.
Fig. 2. *Scianectes lophoptera*, n. sp.
Fig. 3. *Rhomboidichthys azureus*, n. sp., female.
Fig. 4. *Scianectes macrophthalmus*, n. sp.

PLATE XVII.

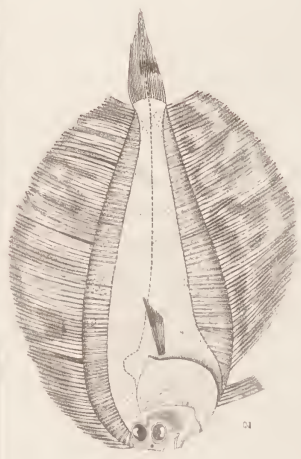
- Fig. 1. *Aphoristia wood-masoni*, n. sp.
Fig. 2. *Aphoristia gilesii*, n. sp.
Fig. 3. *Brachypleura zanthosticta*, n. sp., male.
Fig. 4. *Samaris cristatus*, Gray.

PLATE XVIII.

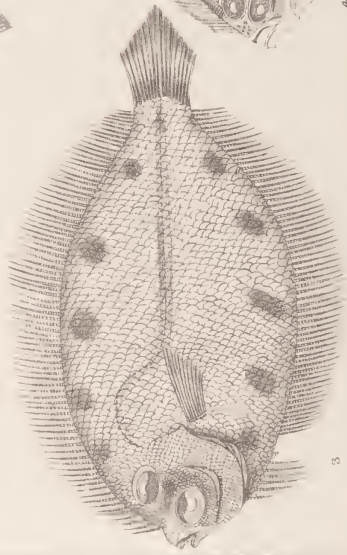
- Fig. 1. *Cynoglossus carpenteri*, n. sp., female.
Fig. 2. *Arnoglossus macrolophus*, n. sp.
Fig. 3. *Solea oculus*, n. sp.
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